

**REMARKS****1. Request for Continued Examination:**

5       The applicant respectfully requests continued examination of the above-indicated application as per 37 CFR 1.114.

          The Amendments made to the claims in the above section are over the last entered amendment filed February 27, 2003.

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**2. Response to Rejections and Introduction of New Claims:**

          The Amendments above address the comments made by the Examiner in the Official Action date May 5, 2003 and the  
15   Advisory Action dated January 8, 2004. In view of the Amendments and arguments set forth below, Applicants respectfully request reconsideration of the claims and believe that the claims are in condition for allowance.

          Claims 4, 8 and 9 have been cancelled without prejudice  
20   or disclaimer. Claim 2 has been amended and Claims 10-14 have been added. Therefore, upon this Amendment being entered, Claims 1-3, 5-7 and 10-14 will be pending in the present application.

25       In the Official Action of May 5, 2003, Claims 1, 3, 4, 8 and 9 were rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Pat. No. 6,020,602 ('602 patent) to *Sugawara et al.* For a proper rejection under 35 U.S.C. 102(b), a reference must disclose **each** and **every** element of the claimed invention.  
30   The '602 patent fails to disclose each and every element set forth in the claims, accordingly, applicants respectfully request the rejection be withdrawn and the claims be placed

in condition for allowance.

The Examiner asserts the '602 patent discloses optoelectronic devices, such as light-emitting diodes, which discloses a device similar to the claimed invention. Specifically, the Official Action asserts that Fig. 3a in the '602 patent which illustrates a cross-sectional view of a GaN based semiconductor optoelectronic device anticipates the device recited in the claimed invention. Applicants respectfully disagree with this assertion.

Independent Claim 1 recites, amongst other features, a light emitting diode including a reverse tunneling layer. The '602 patent fails to anticipate or render obvious such a feature.

The Official Action asserts that the n-cap layer 305 disclosed in the '602 patent corresponds to the "reverse tunneling layer" recited in the claimed invention. The n-cap layer 305 is not similar or equivalent element as the "reverse tunneling layer" recited in the claimed invention. One skilled in the art would appreciate that these two elements would not be confused as being similar because of structural and functional differences.

The reverse tunneling layer disclosed in the claimed invention provides a tunneling effect so that electrons can tunnel through the reverse tunneling layer without being blocked when a voltage is applied on the LED<sup>1</sup>. In contrast, the n-cap layer 305 of the '602 patent is a current blocking layer having a thickness of 1.0 micron (see Col. 11, lines 2-3) and a carrier concentration of  $1.5 \times 10^{18} \text{ cm}^{-3}$  (see Col. 9, lines 3-4). Therefore, the thickness of the n-cap layer 305 is 500 times that of the reverse tunneling layer recited

<sup>1</sup> See Physics of Semiconductor Devices, Second Edition, pgs. 97, 98 and 516-536 for more information on this element.

in the claimed invention. The Examiner asserts that such features are not recited in the claims. However, one skilled in the art would know that the above specification may vary from the specifications listed above and still be considered a "reverse tunneling layer". However, the n-cap layer 305 is so drastically different in both structure and function from a reverse tunneling layer that it is obvious that it does not anticipate the claimed invention.

These structural differences also result in significant functional differences between the two elements. For example, the reverse tunneling layer provides a good ohmic contact with the electrode in direct contact therewith, whereas in contrast, the n-cap layer 305 cannot provide a good ohmic contact with the electrode in direct contact with it. Another major difference between the claimed invention and the '602 patent is the ability to reduce the voltage drop across the Schottky junction formed between the p-electrode and a p-type semiconductor layer. Whereas, the n-cap layer 305 is provided for controlling the current distribution in the active layer to achieve efficient light extraction.

It appears that the Advisory Action concedes that the '602 patent **fails** to disclose a reverse tunneling layer, but attempts to remedy this deficiency by stating that because the n-cap layer 305 can be used to form a current blocked structure, then this "**implies** that layer 305 can be used to form some other functional layer, i.e. reverse [sic] tunneling layer." (emphasis added) Applicants respectfully disagree. One cannot make such assumptions as the reverse tunneling layer is not the same as the disclosed layer in the '602 patent. The reverse tunneling layer is neither anticipated nor rendered obvious. The Examiner cannot use hindsight reasoning or attempt to draw improper conclusions in

attempting to use the applied reference to achieve a layer which anticipates a "reverse tunneling layer".

Independent Claims 5 and 12 also include such a feature, and accordingly, so do claims 6, 7 and 13 which depend from these claims. Therefore all these claims are not anticipated or rendered obvious by the '602 patent.

Claims 5-6 were rejected under 35 U.S.C. 103(a) as being unpatentable over Koide et al in view of Watanbe et al. The Official Action claims that Koide et al. disclose each of the features recited in Claim 5, except for an n+ type reverse tunneling layer positioned on the p-type contact layer. The Official Action attempts to remedy this deficiency by combining Watanbe et al. which alleged discloses a n+ type current blocking layer 7 position on a p type contact layer 6. Applicants respectfully disagree.

For the reasons previously discussed regarding Sugawara et al, the current blocking layer 7 disclosed in Watanbe et al. does not anticipate the "reverse tunneling layer" disclosed in the claimed invention. A reverse tunneling layer is a element which is well known in the art, and the elements the Examiner is referring to is not the same or an equivalent element. Accordingly, these rejections should be withdrawn.

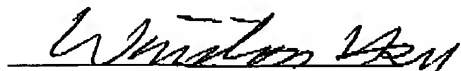
New Claims 12 and 13 include some numerical specification of the reverse tunneling layer which the applied reference fails to disclose or render obvious.

New claim 14 recites a light emitting diode which includes a reverse-tunneling layer in combination with a first transparent ohmic contact electrode directly on the reverse-tunneling layer. The applied references fail to disclose such a combination.

In addition, claim 2 recites a light emitting diode which includes the first transparent ohmic contact electrode and

the second transparent ohmic contact electrode comprise the same non-metal material. The applied references fail to disclose such a feature.

5 Sincerely,



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